

## Factoring Quadratic Expressions - SIMPLE TRINOMIAL

$$x^2 + bx + c$$

The *standard form* of a quadratic is given by  $f(x) = ax^2 + bx + c$ . If  $a = 1$ , it is called a **simple trinomial** and can be factored as follows:

<b>Simple Trinomial</b>	Ex: $x^2 + 8x + 12$
Find two numbers whose sum is $b$ and whose product is $c$ .	$\text{sum} = 8$ $\text{product} = 12$ $\therefore$ numbers are <b>6 and 2</b>
Write two sets of brackets and put the variable used (usually $x$ ) at the beginning of each bracket.	$(x \quad)(x \quad)$
Write the two numbers found in the second part of each bracket.	$(x + 6)(x + 2)$

**Example #1:** Find all possible combinations of two numbers that give the product indicated, and then determine the sum of these two numbers.

Product of ...	Combinations of two numbers that give product ...		Sum of the two numbers ...	
10	$1 \times 10$ $2 \times 5$	$-1 \times -10$ $-2 \times -5$	$1 + 10 = 11$ $2 + 5 = 7$	$-1 + (-10) = -11$ $-2 + (-5) = -7$
15	$1 \times 15$ $3 \times 5$	$-1 \times -15$ $-3 \times -5$	$1 + 15 = 16$ $3 + 5 = 8$	$-1 + (-15) = -16$ $-3 + (-5) = -8$
28				
-6	$1 \times -6$ $2 \times -3$	$-1 \times 6$ $-2 \times 3$	$1 + (-6) = -5$ $2 + (-3) = -1$	$-1 + 6 = 5$ $-2 + 3 = 1$
-12	$-1 \times 12$ $-12 \times 1$ $-2 \times 6$ $-6 \times 2$	$-3 \times 4$ $-4 \times 3$	$-1 + 12 = 11$ $-12 + 1 = -11$ $-2 + 6 = 4$ $-6 + 2 = -4$	$-3 + 4 = 1$ $-4 + 3 = -1$
30				

Product of ...	Combinations of two numbers that give product ...		Sum of the two numbers ...	
10	$1 \times 10$ $2 \times 5$	$-1 \times -10$ $-2 \times -5$	$1 + 10 = 11$ $2 + 5 = 7$	$-1 + (-10) = -11$ $-2 + (-5) = -7$
15	$1 \times 15$ $3 \times 5$	$-1 \times -15$ $-3 \times -5$	$1 + 15 = 16$ $3 + 5 = 8$	$-1 + (-15) = -16$ $-3 + (-5) = -8$
28	$1 \times 28$ $2 \times 14$ $4 \times 7$	$-1 \times -28$ $-2 \times -14$ $-4 \times -7$	$1 + 28 = 29$ $2 + 14 = 16$ $4 + 7 = 11$	$-1 + (-28) = -29$ $-2 + (-14) = -16$ $-4 + (-7) = -11$
-6	$1 \times -6$ $2 \times -3$	$-1 \times 6$ $-2 \times 3$	$1 + (-6) = -5$ $2 + (-3) = -1$	$-1 + 6 = 5$ $-2 + 3 = 1$
-12	$1 \times -12$ $2 \times -6$ $3 \times -4$	$-1 \times 12$ $-2 \times 6$ $-3 \times 4$	$1 + (-12) = -11$ $2 + (-6) = -4$ $3 + (-4) = -1$	$-1 + 12 = 11$ $-2 + 6 = 4$ $-3 + 4 = 1$
30	$1 \times 30$ $2 \times 15$ $3 \times 10$ $5 \times 6$	$-1 \times -30$ $-2 \times -15$ $-3 \times -10$ $-5 \times -6$	$1 + 30 = 31$ $2 + 15 = 17$ $3 + 10 = 13$ $5 + 6 = 11$	$-1 + (-30) = -31$ $-2 + (-15) = -17$ $-3 + (-10) = -13$ $-5 + (-6) = -11$

**Example #2:** Find the pair of numbers that multiply to give number  $P$  and add to give number  $S$ .

P (product)	S (sum)	Pair of Numbers
25	10	5 and 5
21	10	7 and 3
-6	1	3 and -2
8	9	1 and 8
22	-13	-11 and -2
27	12	9 and 3
24	-10	-6 and -4
-18	-7	-9 and 2
10	-7	-5 and -2
-20	1	-5 and 4

P (product)	S (sum)	Pair of Numbers
25	10	5 and 5
21	10	3 and 7
-6	1	-2 and 3
8	9	1 and 8
22	-13	-11 and -2
27	12	3 and 9
24	-10	-6 and -4
-18	-7	-9 and 2
10	-7	-5 and -2
-20	1	-4 and 5

**Example #3:** Factor the following:

\*\*\* When factoring, ALWAYS check for a common factor first! \*\*\*

a)  $x^2 + 7x + 12$

$(x+3)(x+4)$

x	1	1	1	1
x	1	1	1	1
x	1	1	1	1
$x^2$	x	x	x	x

b)  $x^2 + 12x + 35$

$(x+7)(x+5)$

c)  $x^2 + 2x - 8$

$(x-2)(x+4)$   
 $4(-2) = -8$   
 $4-2 = 2$

d)  $x^2 + 6x - 16$

$(x-2)(x+8)$

e)  $x^2 + 4x + 5$

$(x+1)(x+4)$

f)  $2x^2 - 24x + 40$

$2(x^2 - 12x + 20)$

$2(x-2)(x-10)$

g)  $x^3 + 12x^2 + 27x$

$x(x^2 + 12x + 27)$   
 $x(x+3)(x+9)$

h)  $4a^2 + 16a + 48$

$4(a^2 + 4a + 12)$   
 $4(a^2 + 4a - 12)$   
 $4(a+6)(a-2)$